CLEAN DIESEL AND HYBRID TECHNOLOGIES

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Clean Diesel Technology

- EPA will soon propose more stringent emission regulations for heavy-duty diesels to go into effect around 2007
- 2007 regulations are almost certain to require emission control devices to reduce NOx and PM
- Ultra-Low sulfur diesel fuel is widely acknowledged as necessary to meet the 2007 regulations

Clean Diesel Technology

- It is reported that EPA will propose a 15 ppm sulfur cap on diesel fuel to coincide with the 2007 regulations
- Refiners are currently proposing a 50 ppm cap instead
- One thing appears clear, ultra-low sulfur diesel fuel will not be widely available until then

Clean Diesel Technology

- Refiners say that 50 ppm sulfur diesel fuel will cost 5-6 cents/gallon more - they have been silent so far on what a 15 ppm diesel fuel would cost
- Large difference in capital costs to produce 50 ppm and 15 ppm sulfur diesel fuel

Clean Diesel Technology Summary

- Clean Diesel Technology will start to provide benefits when 2007 engines are available
- Engines and fuel will cost more
- Clean diesel fuel will not be widely available until 2007 engines are available
- Proper maintenance of emission control systems will be required

Hybrid Bus Technology

- Great promise for reducing fuel use and emissions from transit buses
- Most use an electric drive system and engine-powered generator
- Key to benefits is engine load-leveling and capturing braking energy
- Benefits depend on driving cycle
- Currently in prototype stage

Hybrid Bus Technology

- Recent NAVC report illustrates emissions potential of hybrid buses - however:
  - Hybrid engines and emission control systems brand new compared to used CNG buses
  - Used zero-sulfur Fischer-Tropsch diesel fuel
  - Did not measure air toxics
- CNG buses still cleaner
  - Even greater benefits from hybrid buses using natural gas engines

Hybrid Bus Technology

- Hybrid buses will have to use the advanced emission control systems acknowledged to be necessary to meet the 2007 regulations, and which require ultra-low sulfur fuel
- CNG engines will also likely need similar emission control systems, but smaller and less costly - more durable due to zero-sulfur fuel

Hybrid Bus Technology

- Costs
  - Around twice the incremental cost of CNG
  - Brake maintenance cost should be reduced
  - Battery life undocumented but unlikely to last the life of the bus
  - Fuel cost reduced, but likely will be offset by battery replacement costs
  - Significant training required

Hybrid Bus Technology

- Many manufacturers are working on hybrids
- Orion is taking orders for hybrid buses
- AVS has 30 foot bus with gas turbine hybrid power system

Hybrid Bus Technology Summary

- Hybrid technology holds much promise, but expensive and several years away from quantifying durability and operating costs
- More complex than other options and will require significant training
- In prototype stage and will likely not be widely available for several years
- Benefits dependent on driving cycle